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## Notes on some Collembola of the Pacific Coast of North America

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The present paper deals with the nearctic species of Collembola of the western states whose taxonomic characters were incompletely known to us. Materials were collected by the first author and their research was made by the pan-pacific collaboration.

1. *Folsomides decemoculatus* MILLS, 1935

Radmond, Oregon (12 ex. in ant's nest. 10. II 1965)

In contrast to MILLS' description there is no trace of a ventral seta on dentes. Mucro is bidentate and confluent with the precedent segment. Thus we have failed to find any morphological difference between this species with 5+5 eyes and *F. parvulus* STACH, 1922. Possibly it may be regarded as *F. parvulus* f. *decemoculata* MILLS. The same may be said of *F. americanus* DENIS, 1931 of Costa Rica.

Distribution: USA (Utah, Oregon)

2. *Isotoma (Desoria) notabilis* SCHÄFFER f. *pallida* AGRELL, 1939 Fig. 1, A-B.  
Sta Lucia Mts., California (10 ex. 1. II 1969)

The examples show all the transient forms between f. *pallida* AGRELL with 1+1 eyes and eyeless f. *coeca* YOSII. In some examples the eye pigment is present, but cornea is not detected. In contrast to the description and figure of YOSII, 1966, the lateral flap of the ventral tube bears only 3 setae constantly. Anterior face has 3+3 setae (erroneously described as 2+2 in the cited report) and posterior face bears either 3 or 5 setae. Corpus tenaculi has two setae constantly. May this difference indicate the character of *I. eunotabilis* FOLSOM, 1937?

Distribution: cosmopolitan

3. *Pogonognathellus dubius* (CHRISTIANSEN, 1964)

Fig. 1, C-D

Mackenzie River, Oregon (5 ex. 11. IX 1968)

The species is near *P. borealis* YOSII, 1967. Proximal dorsal tooth of mucro is large and located at about the one third of its full length, but it has no corner-toothlet in this species. Lateral setae of manubrium is very thick and short.

Distribution: USA

3. *Plutomurus wilkeyi* (CHRISTIANSEN, 1964)

Mackenzie River, Oregon (6 ex. 11. IX 1968)

In morphological details these examples coincide well with the previous descriptions. Absence of large lateral setae on manubrium is a very specific character. In our examples the lateral margin of the tergite on th. II, III is broadly pigmented black,

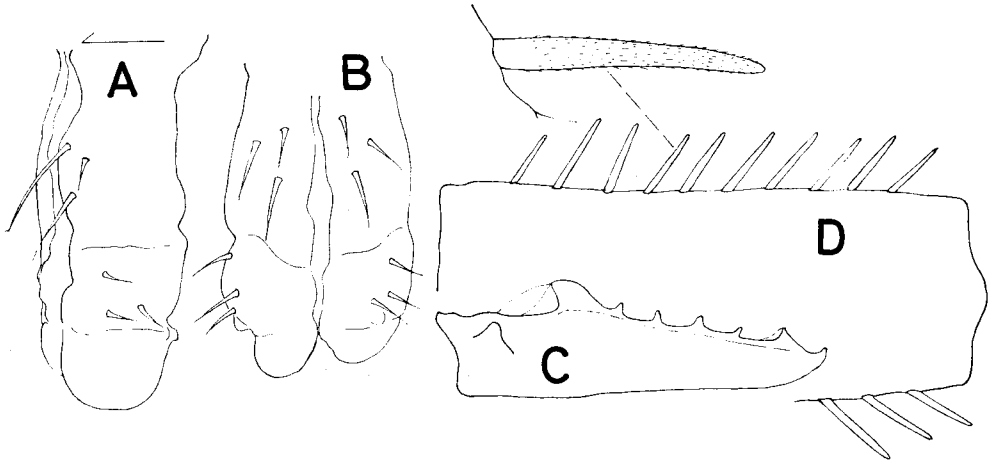


Fig. 1. *Isotoma notabilis* (SCHÄFFER) f. *pallida* AGRELL: A, B: ventral tube (lateral, frontal view)

*Pogonognathellus dubius* (CHRISTIANSEN): C: mucro, D: lateral setae of manubrium

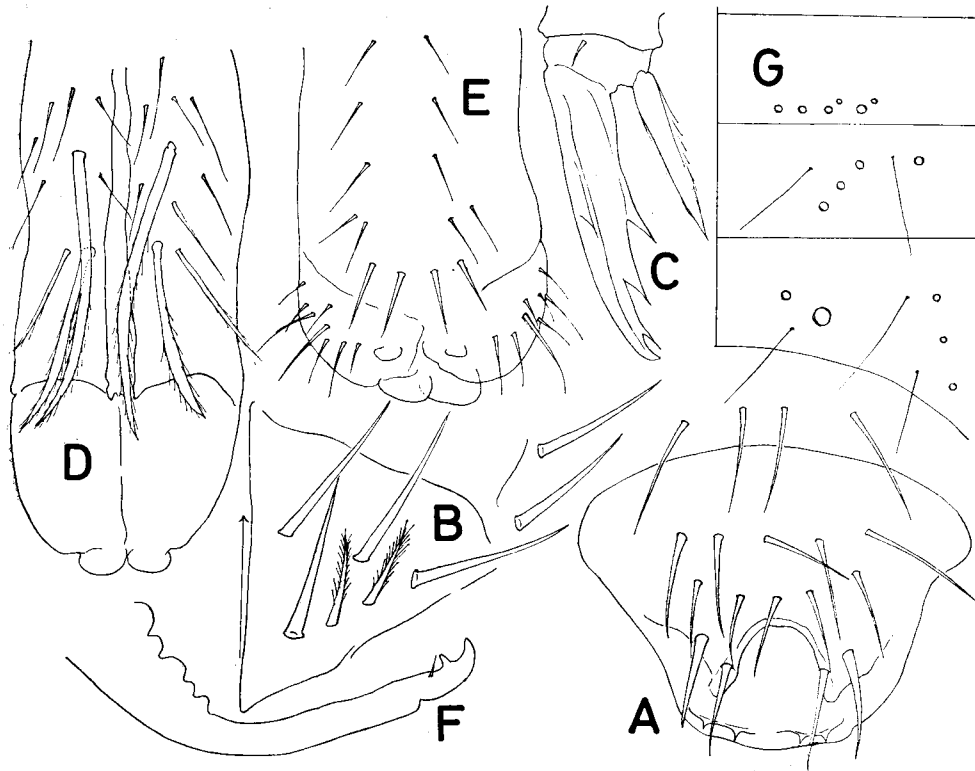


Fig. 2. *Entomobryoides purpurascens* (PACKARD)

A: labrum, B: labial basis, C: hind-claw, D, E: ventral tube (anterior, posterior view), F: mucro, G: chaetal arrangement

the feature quite peculiar to this species.

Distribution: USA

4. *Sinella binocularata* (SCHÖTT, 1896)

Monterey Co., California (1 ex. 11. IV 1969)

One example at hand is not in a nice condition. However, there may be found a row of smooth setae along the posterior margin of each tibiotarsus. SCHÖTT's note about the possible presence of body scales must be denied. Identity with the Vietnamese species: *Sinella boneti* DENIS, 1948 is probable.

Distribution: USA (California, Oregon)

5. *Entomobryoides purpurascens* (PACKARD, 1873)

Fig. 2

Mackenzie River, Oregon (2 ex. 11. IX 1968), Banff, Alberta, Canada (6 ex.)

The species is already well established, the details are given in CHRISTIANSEN 1958 to which our examples coincide well. However, there must be given some commentary notes: Eyes are usually in a cluster of black pigments, but in poorly pigmented examples there may be seen 6+6 eyes separately pigmented. The labral setae are 4/5, 5, 4, prelabral setae are smooth, labral margin with four cusps and median intrusion is broadly rounded. Labial basis bears setae as in fig. B, which may be denoted as mRRe/ll. It is the intermittent form of *Entomobrya* with MRRE/LL and *Sinella* with mrre/ll. Tenent hair is distally broad, but not very conspicuously and inner tooth of unguis is rather enlarged and almost wing-like. Spiny setae of tibiotarsus are, as already mentioned, finely ciliate, but those of the distal portion of the segment are almost smooth. Dorsal side of the manubrium is hirsute, but without smooth setae. Most characteristic to this species, the setal arrangement of the ventral tube is quite alike to that of *Sinella* and not akin to *Entomobrya*. In anterior face it has 2+2 large, feathered setae and in posterior face it is with 4 smooth distal setae plus ca. 10+10 feeble setae in symmetry. Lateral flap bears only smooth and no ciliate setae. Chaetal arrangement on each tergites are fairly constant in all examples examined, that of abd. I-III is characteristic.

In view of these results *Entomobryoides* seems to be more nearly related to *Sinella* than to *Entomobrya*. The species is near *E. myrmecophila* (REUTER) of Europe from which it is different decidedly in the chaetal arrangement and labial basis (cf. SZEP-TICKI 1969). The relation with the other members of the genus: *E. dissimilis* DENIS, *E. guthriei* MILLS etc. must be discussed. *Sinella pulcherrima* AGRELL, 1939 of Madeira would be also a near relative of this species.

Distribution: USA, Canada

6. *Sminthurides plicatus* (SCHÖTT, 1891)

Fig. 3

Santa Lucia Mts., California (4 ♀, 2 ♂ 1. II 1960)

Female: Body length 0.6 mm., ground colour is brownish white, dorsal side of the trunk is deeply and uniformly purplish throughout. Antennae violet distally. Head pale excepting the dark marking around the mouth and black eye-patch. All extremities are pale. Antenna is observed in one side of an example, others being mutilated. It is short, ant.: head being 65:50 and ant. segm. ratio as 5:10:15:30.

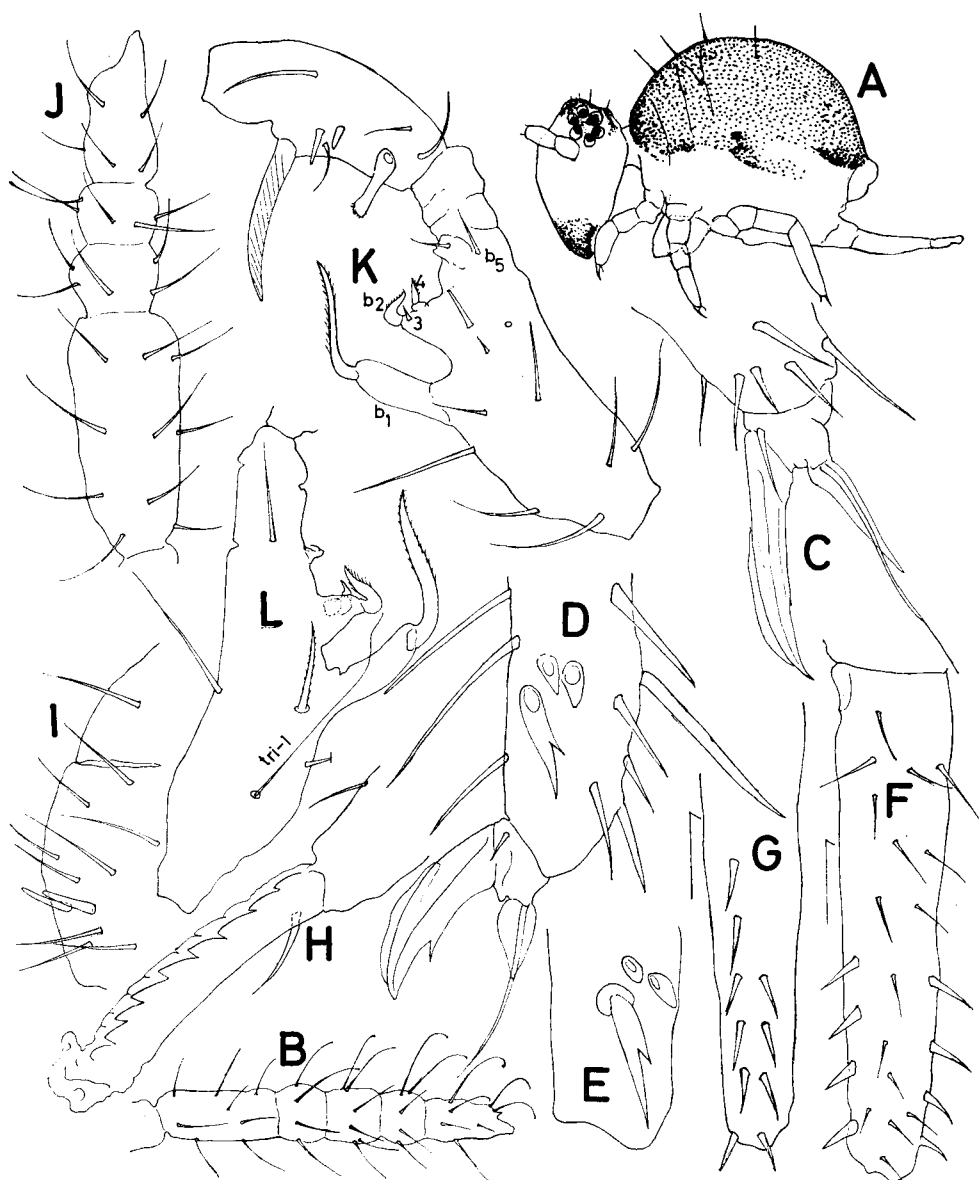


Fig. 3. *Sminthurides plicatus* (SCHÖTT) : A-I female, J-L male  
 A: habitus, B: ant. IV, C: fore-leg, D: hind-leg, E: tibiotarsal organ,  
 F, G: dentes (dorsal, ventral view), H: mucro, I: anal region (lateral view),  
 J: ant. IV, K: ant. II, III, L: ant. II (inner view)

Ant. III-organ is not observed, seemingly not unusual in structure. Ant. IV is subdivided into 5 subsegments, each annule with a quirl of setae, distal ones are elongate and lightly knobbed at the end. Vertical setae relatively long, lightly blunt

on apex. Vertical swelling is conspicuous. Facial setae not modified. Eyes 6+6, black, but each cornea is isolated not to form a common patch. On fore-legs unguis is very slender, with one inner tooth and with an obscure dorsal tunica. Unguiculus is acute distally and with a long axial seta surpassing the unguis. A pair of empodial setae are very long. Setae of the tibiotarsus are not modified, but those of the posterior margin are thicker than others. On hind-legs both unguis and unguiculus are broad, the former is distinctly tunicate and with an inner tooth. The tibiotarsal organ is bifurcate unequally and with two accessory tubercles. Some setae of the tibiotarsus are thick and spiny, but other setae are very slender. Ventral tube is not modified, the shaft bears 1+1 distal setae. Tenaculum has tridentate rami and corpus bears 2 slender anterior setae and one apical seta. Furca short, man.:d.:mu. as 10:35:13, manubrium is dorsally with some feeble setae. Dental setae as in fig. F, G, where four distal setae on the inner and outer row are thick, while others are normal. Mucro is parallel to each side, with a large apical swelling and its inner margin is beset with ca. eight distinct serration, while the outer margin is more hyaline and with ca. 10 obscure incisions. A distinct mucronal seta is present. Setae of large dorsum is strong, erecting and pointed, those of the posterior part are smaller. On anal segment there has been found 2+2 small, blunt and short setae closely near the margin of the lateral flap, close to the genital orifice (fig. I), whose character is not clearly detected.

Male: Body length 0.5 mm., colour same as the female. Morphologically it is almost concordant with female. Thoracal vesicle is not observed. The tibiotarsal organ is present in the same form. Very characteristic to this species ant.IV is subdivided into four annules alike to the structure of females. Ant.III with c-1, 2, 3 and ant.II with b-1 to b-5. There is a tri-1 on the inner side of the segment and B-1 is seemingly barbed. No sensillate setae are observed.

The species is, as already suspected by FOLSOM et MILLS 1938, STACH 1956, belonging to *Sminthurides* without doubt. It has many characteristic features. Mucronal form is very peculiar, male is without thoracal vesicle and ant.IV of male is subsegmented etc. Probably it is the near relative of *Sminthurides pseudassimilis* STACH, 1956 by the last mentioned character from which it is different by the body colour and mucronal form.

Distribution: USA (California)

7. *Arrhopalites* (coecus-gr.) *diversus* MILLS, 1934  
 Santa Lucia Mts., California (1 ♀, 1. II 1969)

Fig. 4, A-F

The species is characteristic with the elongate inner tooth of unguis. Our example coincides well with the description of CHRISTIANSEN in the chaetal arrangement of dentes, whose setae are remarkably as 3, 2, 2, 1, 1 ventrally and without c-6 id-3 dorsally. But mucro is more elongate, without bulbous swelling apically. Anogenital segment is peculiar with well developed anal setae, they are intensely winged with the exception of slender a-o of upper anal flap. Digital process is conical and placed side by side in upper anal flap and there seems to exist an obscure third one on

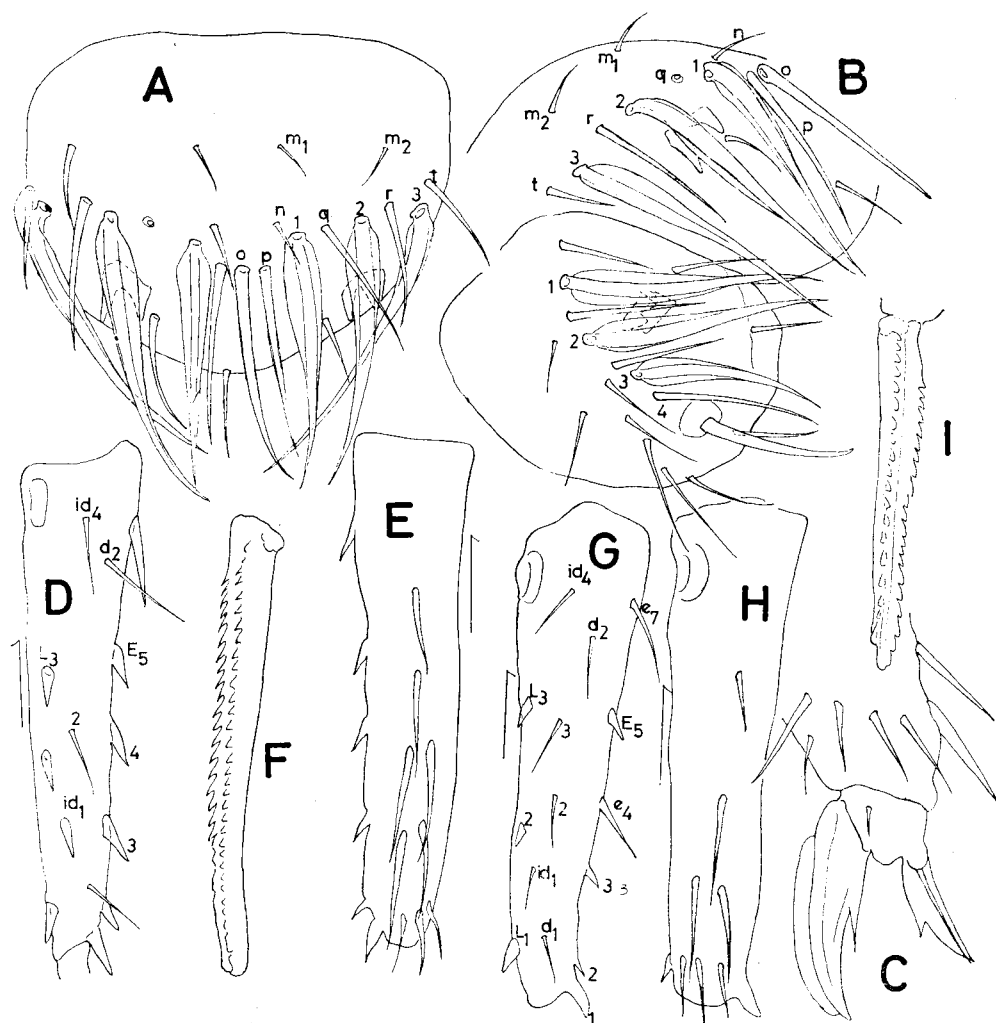


Fig. 4. *Arrhopalites diversus* MILLS A, B: anal region (dorsal, lateral view),  
C: hind-claw, D, E: dentes (dorsal, ventral view), F: mucro  
*Arrhopalites cf. hirtus* CHRISTIANSEN G, H: dentes (dorsal, ventral view),  
I: mucro

lateral flaps. Appendix analis is simple and lightly curving.

Distribution: endemic to USA

8. *Arrhopalites* cf. *hirtus* CHRISTIANSEN, 1966  
Santa Lucia Mts. California (1 ♀ 1. II 1969)

Fig. 4, G-I

One example at hand is without head and legs. The dental chaetotaxy shows, however, that it belongs to the *hirtus*-group of CHRISTIANSEN, the seta e-6 being absent. In this example it has been found that the seta e-5 is spiny and, remarkably, the seta a-o of the upper anal flap is bifurcate deeply as in case of *A. habei* YOSHI, 1956.

In the cited species, however, the seta e-6 is present and e-5 is not spiny.

9. *Sminthurinus* (niger-gr.) spp.

Santa Lucia Mts., California (10 ex. 1. II 1969), Mackenzie River, Oregon (6 ex. 11. IX 1968)

They may be classified in four forms, each with a peculiar pattern of the body. One of them is quite pale and near *S. modestus* YOSHI, 1970 having the ventral setae of dentes as 4, 2, 2—1. Another is near *S. quadripunctatus* EDINGER, 1937 and the other is near *S. albifrons* TULLBERG in the body pattern. For exact studies, however, more materials are in need.

10. *Deuterosminthurus* (*Andiella*) *cingulus* BONET, 1934

Fig. 5

Smis Coalina, California (10 ex. 16. IV 1958, H. WILSON coll.)

Body length up to 0.5 mm. The species has two types of body pattern. In the paler form the body is beset with scattered black spots laterally to give the gray tone, while in the darker form the place is occupied with dark pigments almost equally to the posterior half of abdominal part. These difference is, however, not of sexual nature, both females and males are detected in the paler form. Antennae slender, ant.: head as 16:10, ant. segm. ratio as 15:30:40:80. Ant. IV is consisting of up to 10 subsegments, the basalmost one is very long. Ant. III-organ is two rods in a groove, with some lightly curving setae by them. All of the facial and vertical setae are slender, not modified. Ocular patch is black and with 8+8 eyes. Labrum with setae 6/5, 5, 4, the median setae of the first row small, the lateral seta of the third row is converted to curving spinules. Labral margin bears a conspicuous pair of tubercles, whose apex is intensively bifurcate. Abdominal part is densely covered with slender but curving smooth setae, especially they are numerous on distal half of it. Unguis is short, quite untoothed. Unguiculus small, half of the unguis in length, triangular in form and with a long axial seta surpassing the unguis and its apex is broadly dilated. Tenent hair 3, 3, 2, arranged to the outer side near the unguis. They are thickly built and their apex is broadly truncate in a peculiar way. Posterior side of each tibiotarsus bears two longitudinal rows of thick, spinose setae, their number varies from 6 to 10. Sometimes they are lightly truncate distally. Terminal tubule of the ventral tube is with warty walls, the shaft bears 1+1 setae subapically. Tena-culum bears 3 teeth to each ramus and its corpus bears 3 minute apical setae. Furca in ratio as 50:60:23. Manubrium is with 6+6 slender dorsal setae. Dental chaetal arrangement as in fig. H, I, all of them are slender and smooth. Ventral setae are as 3, 3, 1, 1—1, but the inner seta of the second subapical group is smaller than others. Mucro is straight, with both margins smooth and entire. A faint mucronal pseudonychium is present. On genital segment all setae are slender, without modification. Anal segment as in fig. J, appendix analis is straight, spinose, smooth, one half the length of mucro and faintly blunt on apex. Integument is finely granular all over. Genital aperture of male is very large and surrounded with numerous setae.

The Californian examples correspond fairly well with the description and figure of BONET. So the number of tenent hairs are 3, 3, 2 as indicated by DEEMARE et



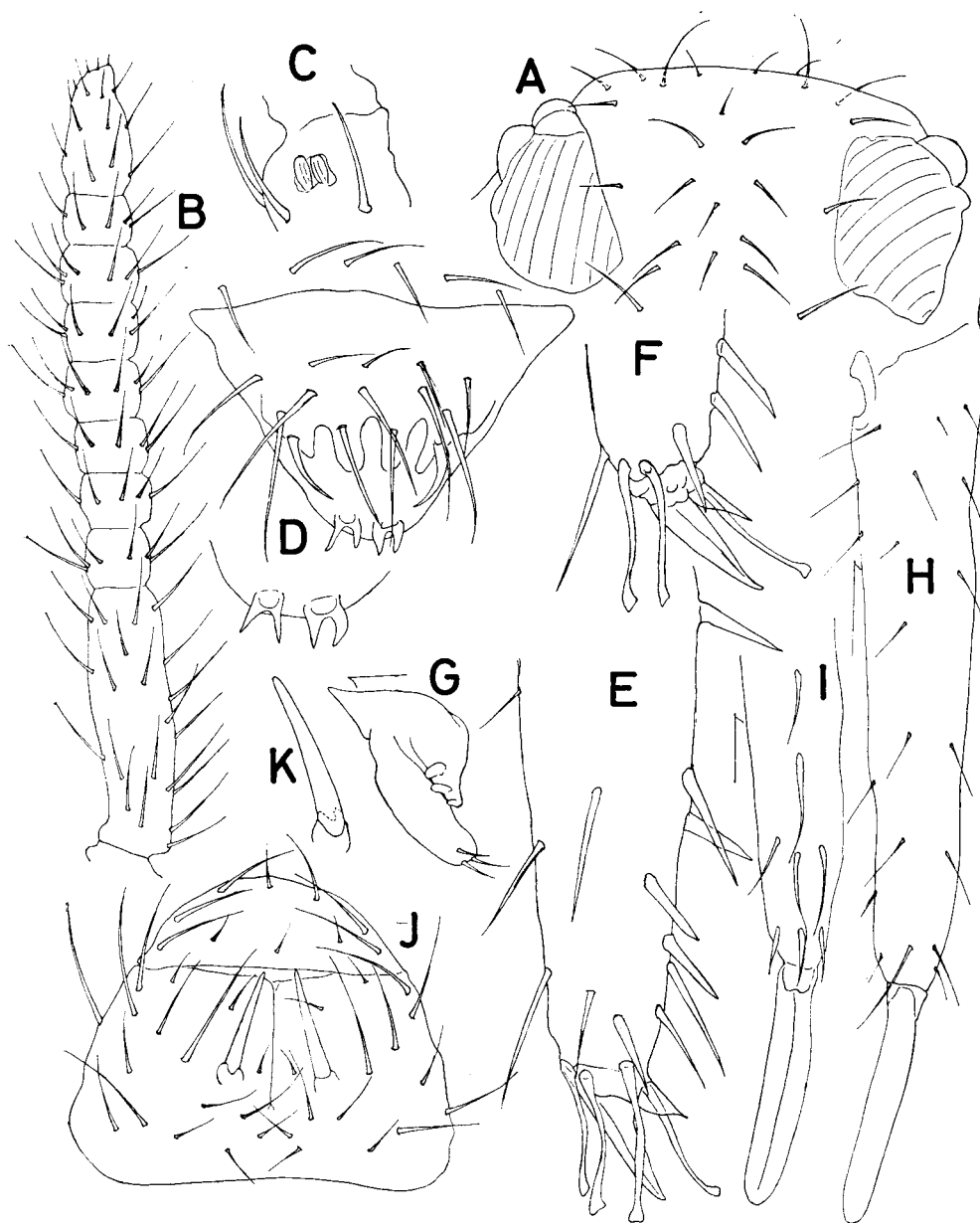


Fig. 5. *Deuterosminthurus (Andiella) cingulus* BONET

A: vertex, B: antenna, C: ant.III-organ, D: labrum, E: fore-leg,  
 F: hind-claw, G: tenaculum, H, I: denticles (dorsal, ventral view), J: anal  
 region, K: appendix analis

MASSOUD 1963 and unguis bears no sign of inner tooth etc. The body pattern is also concordant with his figure, although it means no sexual dimorphism. Number

of subsegments on ant. IV is larger than in BONET's description, but it is variable as the subsegment becomes obscure by the treatment of the example.

Distribution: Argentine, USA (nov.)

For the classification of the *Andiella*-group of *Deuterosminthurus* the chaetal arrangement of the ventral (posterior) side of dentes seems to have a special merit as in case of *Sminthurinus*. Assumed that it is constant within each species we may arrange the known forms of *Andiella* in the following way:

1. Ventral setae as 3, 3, 1, 1—1  
*patagonica* DELAMARE et MASSOUD, 1962 ————— Argentine  
*pampeana* RAPOPORT et BIANCO, 1962 (sensu DELAMARE et MASSOUD 1962) — Argentine  
*Paryskii* STACH, 1955 ————— Patagonian Andes  
*izarrae* NAJT, 1969 ————— Argentine  
*cingula* BONET, 1934 ————— Argentine, USA (nov.)
2. Ventral setae as 3, 2, 1, 1—1  
*quinquefasciata* (KRAUSBAUER, 1902) sensu JEANNENOT 1956 — Europe  
*spathacea* (BÖRNER, 1907) sensu HÜTHER 1969 ————— Africa
3. Ventral setae 2, 2, 1, 1—1  
*procingula* DELAMARE et MASSOUD, 1962 ————— Argentine  
*olivieri* DELAMARE et MASSOUD, 1962 ————— Argentine
4. Ventral setae unknown  
*domeykoi* STACH, 1955 ————— Patagonian Andes
11. ***Bourletiella arvalis*** (FITCH, 1863) Fig. 6  
 Salinas, California (many examples)

To discuss the identity of *B. arvalis* (FITCH) with *B. lutea* (LUBROCK) I have investigated these examples with special care. The result is that, as already suspected by STACH 1956 etc., they are quite identical in detail. The description below coincides completely with those observed by JEANNENOT in 1954 for *B. lutea* of France.

Body colour yellowish with faint shadow of gray on abdomen, which is darker in females. Labral setae 6/5, 5, 4, median three setae of the first row are smaller and a lateral seta of the second row is anterior, near the third row. Labral margin bears a pair of small incisions. In females setae of large abdominal dorsum are slender. Anal setae are as in fig. B, where those of the upper anal flap are faintly ciliate or rugose, while those of the lateral flaps are smooth. Appendix analis is foliaceous, laminate and with many faint striae. Facial and vertical setae of the head is not differentiated in both sexes. Dental setae ventrally as 3, 2, 1, 1—1. In males posterior dorsum of large abdominal part is beset with many thick setae, almost spiny in appearance. Dorsal crasping organ of abd. VI is in a primitive state for the genus. A faint median furrow is stretched between two modified setae (a and p), a-seta is elongate and tapering, but not coiled distally, while p-seta is thick and strongly curving. On each side of the furrow there are 2+2 very thick setae (L-1, L-2), both of them are curving and pointed. 3+3 setae anterior to a (a-1, a-2, a-3) are all slender and not differentiated.

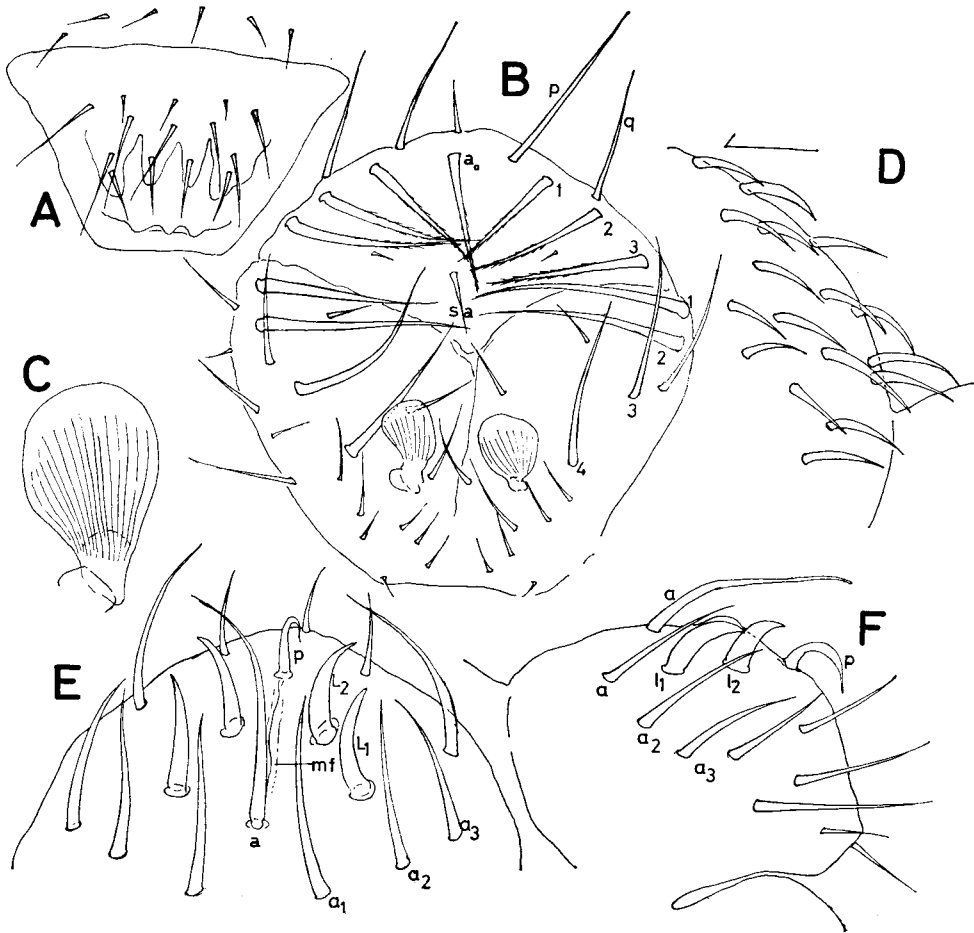


Fig. 6. *Bourletiella arvalis* (FITCH)

A: labrum, B: anal region of female, C: appendix analis, D: posterior part of abdomen in male, E, F: crasping organ of male (dorsal, lateral view)

The presence of this cosmopolitan species in California is already reported in SCHÖTT 1891, but as his example seems to have different pattern of the body it may be an another species of the genus.

12. *Ptenothrix marmorata* (PACKARD, 1873)

Fig. 7

Monterey Co., California (4 ex. 10. IV 1969), Big Sur Park, California (3 ex. 12. V 1963)

The species is relatively well known by the works of FOLSOM 1934 and others with respect to the pattern of the body. Following notes are to be added: Body pattern is variable according to the individual, but legs are always beautifully banded. Anogenital segment has dorsally a large pale area. Labral setae 6/5, 5, 4, median three setae of the first row small. Facial setae 1, 1, 2, 2, 1, 3 as in fig. C, all of them

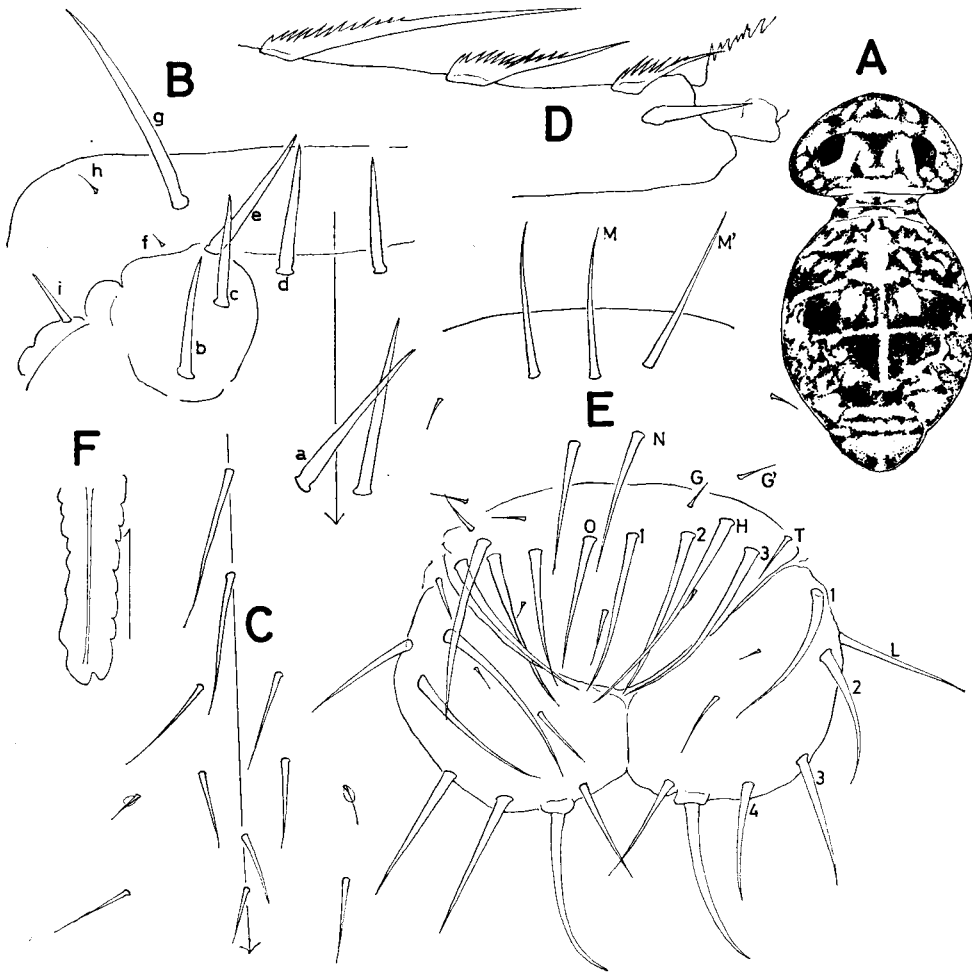


Fig. 7. *Ptenothrix marmorata* (PACKARD)

A: habitus, B: vertex, C: frontal setae, D: outer row of dental setae,  
E: anogenital region, F: mucro

are slender and never blunt. Vertical setae well developed, all slender and lightly rugose, but not blunt on apex, a-seta is very long, b. c. d. e are subequal, g is very long, while f and h are reduced to minute seta. i-seta present. On large abdominal dorsum five pairs of anterior setae are large, pointed and simple. Setae of the anogenital segment is very peculiar in that M, M' and N are all slender, pointed apically and lightly rugose. G and G' small, while H is very much elongate, surpassing the length of the usual anal setae. sa is well developed, larger than the lateral sa'. Laterally sa-2 is larger than sa-1 and appendix analis is very slender, much longer than anal setae. In two examples at hand seta s has not been detected, probably they have fallen off. Dentes bears normal arrangement of setae, four dorsal setae are often

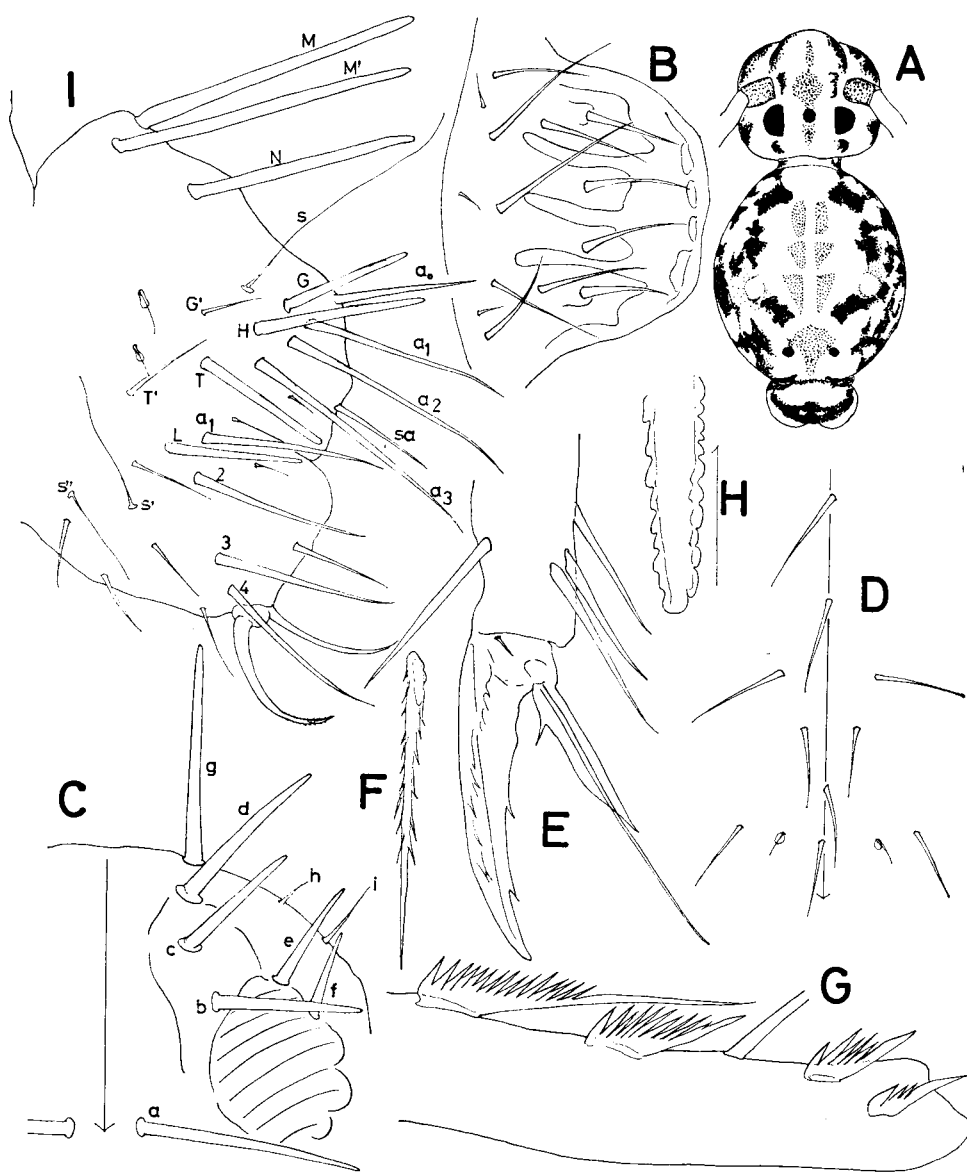


Fig. 8. *Ptenothrix maculosa* (Schött)

A: habitus, B: labrum, C: vertex, D: frontal setae, E: hind-leg,  
 F: modified tibiotarsal seta, G: outer row of dentae, H: mucro,  
 I: anogenital region

rugose. The most distal seta of the outer lateral row is slender, but the second one is serrate. From the inner lateral row all distal setae are intensely serrate. Mucro is narrow, with ca. 25 inner and outer teeth and its apex is finely incised as in fig. F. Two modified setae of hind tibiotarsus are irregularly feathered.

The species is peculiar in many respects. That all setae of the genital segment are not blunt, but slender and pointed is already known in *Pt. leucostrigata* STACH, 1957 of Europe to which the species is probably nearly related. In the cited species, however, the body pattern is quite different and the second dental seta of the lateral outer row is not typically serrate.

Distribution: USA

13. *Ptenothrix maculosa* (SCHÖTT, 1891)

Fig. 8

Rosenburg, Oregon (6 ex. 30. X 1957), Santa Lucia Mts., California (4 ex. 1. II 1969)

Large species with the body length up to 2.5 mm. Ground colour yellowish white. Brown patches along the median dorsum are separated in two or three pairs to give a very peculiar pattern to the abdomen. A median patch of the same colour is on the head and on posterior part of abdomen. Laterally there are irregular black patches and mottlings. Anogenital segment is pale, but encircled with black pigments in dorsal view. Antennae are lightly brown throughout, but darker distally. Legs are brownish distally and with a black patch on femur and tibiotarsus. Ventral side and furcula pale. Antennae usual for the genus. Labral setae 6/5, 5, 4, the median three setae of the first row are small. Labral margin with 4 transverse tubercles. Facial setae slender, pointed, 1, 1, 2, 2, 1, 3 in number, but in contrast to *P. marmorata* it is the type of Japanese *P. janthina* BÖRNER (cf. YOSHII et LEE 1963, p. 29, fig. 15, B) by which the first pair is broader and wider separated than the second pair of setae. Vertical setae are long and rugose, seta a is very long and pointed, while b to g are all well represented and blunt on apex. Legs are slender, each tibiotarsus bears many almost spiny setae, they are roughly rugose. Unguis very slender, with 2, 2, 2 inner teeth and obscure, serrate dorsal pseudonychium. Unguiculus is beset with long axial seta surpassing unguis and ending blunt apically. Hind tibiotarsus bears two modified, lightly feathered setae. Tenaculum normal. Dentes bears usual arrangement of setae. In the outer row the ultimate four setae are all distinctly plumose and in ratio of 3:4:5:10 in length. In the inner row the ultimate four setae are also intensely plumose. Dorsal four dental setae are all rugose. Mucro is narrow, with ca. 25 outer and 30 inner teeth and without an apical notch. Mucronal pseudonychium well represented. On large abdominal part 5+5 anterior setae are very long, blunt ending and rugose. Anogenital segment bears typical setal arrangement, but M, M' and N are long and distinctly blunt. G, H and T are subequally long and also blunt. All of the anal setae are slender, smooth and pointed on apex. sa is about 2/3 of them, while sa' is very small. On lateral flaps a-1 to a-4 are slender, sa-1 is small, sa-2 is as large as sa and sa-3 is much larger. Appendix analis is slender, pointed apically and strongly curving in lateral view, the part is lightly rugose in one large

example at hand.

With its large body setae and by the arrangement of facial setae the species is the near relative of *P. janthina* BÖRNER,\* 1909 (l. c.) of Japan, although the pattern is quite different and M, M', N are much larger in the cited species. From *P. mar-morata* (PACKARD) the species is to be discriminated by the blunt anogenital setae as well as by the different arrangement of facial setae.

*P. olympia* (MACGILLIVRAY, 1894) is described with an incredibly obscure notation of the body colour. But the species is redescribed by FOLSOM 1934 and it reveals the total identity with *P. maculosa* so long as the body pattern is concerned.

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\* After International Code of Nomenclature this species must be named as *Ptenothrix janthina* BÖRNER, 1909 and not as *P. janthina* YOSII, 1963.